

# The transition from carbon energy sources to the bioeconomy

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The transition from fossil-based raw materials to renewables has already begun, and tomorrow's bioeconomy is being created today. As part of its Bioeconomy Transformation spearhead programme, VTT Technical Research Centre of Finland has developed technologies suitable for application in new kinds of value chains; in these, the value created by Finland's agro and forest biomass is efficiently exploited as food, fibre products, chemicals and fuels.

The Bioeconomy Transformation programme has resulted in the development of new products and technologies for industry; the establishment of internationally award-winning spin-offs; and large numbers of patents, scientific publications and doctoral dissertations.

"Much has happened in five years. We are seeing an unprecedentedly strong wave of investment, with new companies and businesses already appearing in the sector. As a scientist, I am excited to see long-term research projects proceed towards industrial exploitation: examples include lignocellulose-based ethanol and lignin applications," says Kristiina Kruus, Research Professor and leader of the Bioeconomy Transformation spearhead project.

A key aim has been to promote the renewal of Finland's industrial sector. VTT has around 200 customers in the bioeconomy sector, for which it has developed for instance composites, packaging materials, nanocellulose, textile fibres, foodstuffs, feed, biofuels and biochemicals. A multi-technological approach has been needed to achieve these goals,

since the bioeconomy combines areas such as chemistry, biotechnology, process engineering, modelling, electronics, the social sciences and information technology.

VTT's strengths include the ability to scale up proven ideas from laboratory towards production scale. Its new ace in this respect is the Bioruukki Pilot Centre in Espoo established in 2015. It's the largest of its kind in the Nordic countries. It combines VTT's expertise in chemistry, energy and biomass processing. An example of the technologies being developed in Bioruukki is fast pyrolysis that Fortum is using in its bio-oil plant in Joensuu. Fortum uses forest residues as a raw material, and the heat produced in the bio-oil plant would suffice for more than 10,000 detached houses.

Several spin-off companies were established during the programme, based on technologies developed by VTT: these include Spinnova Ltd, which spins yarn directly from wood; Paptic Ltd, which makes paper bags that have features of plastic ones; GrainSense Oy, which makes portable devices for measuring grain quality and Spectral Engines Oy, which makes smart spectral sensors.

The programme had a major scientific impact in addition to its industrial results. A total of 1200 peer-reviewed scientific articles were published in the field of [bioeconomy](#) and 140 patent applications were filed during the programme. Total 28 doctoral degrees were granted, with more to come since some dissertations have yet to be examined.

**More information:** The Making of Bioeconomy Transformation 2017: [makingoftomorrow.com/the-making ... transformation-2017/](http://makingoftomorrow.com/the-making...transformation-2017/)

Provided by VTT Technical Research Centre of Finland

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